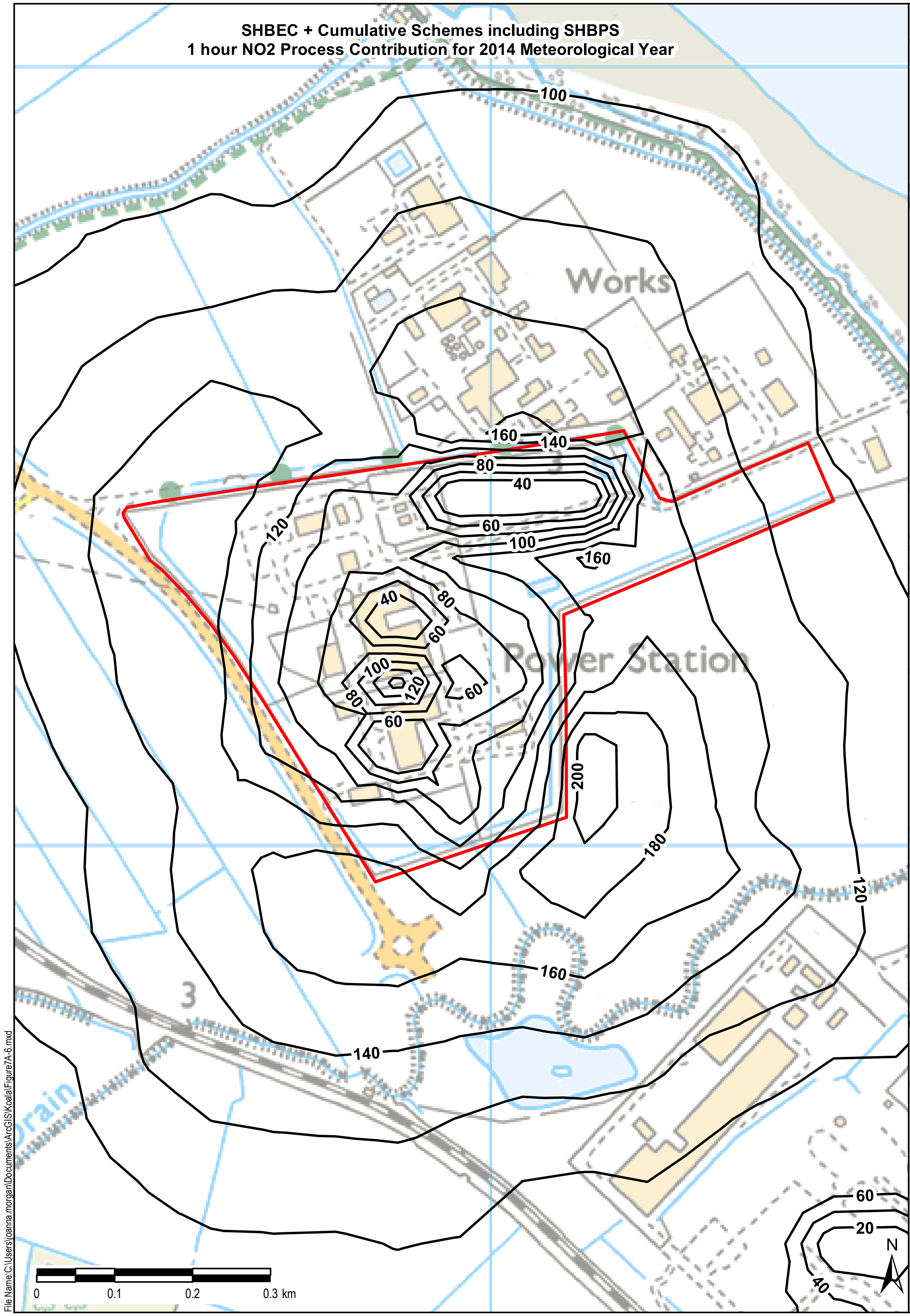
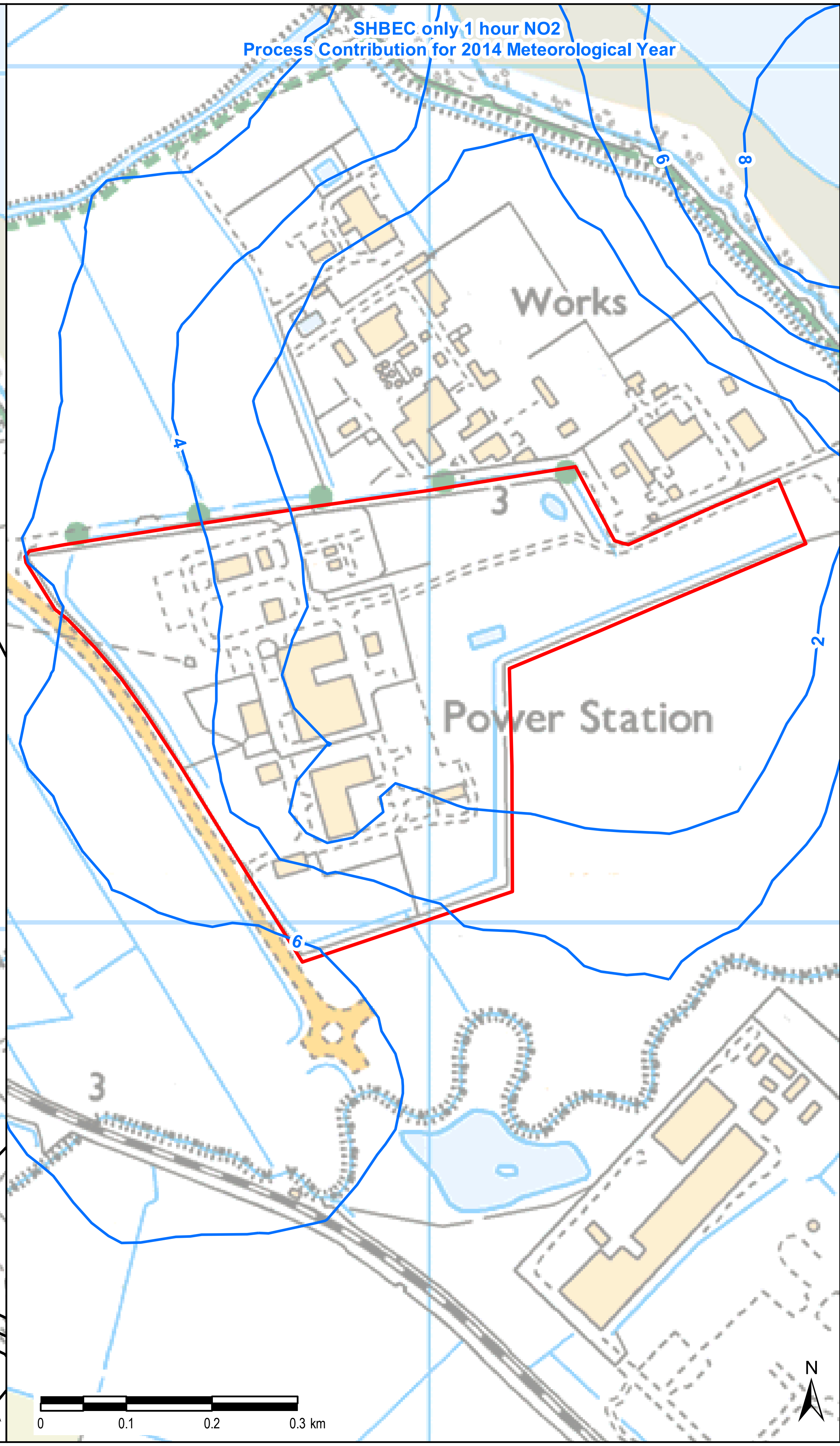
Figure 7A.6: Short term maximum NO_2 Process Contribution 2014 Meteorological year for Proposed Development and for cumulative schemes





THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

Left Insert

Application Boundary

NO_2 1 hour Mean Process Contribution Cumulative Schemes including SHBPS (μg/m³)

Right Insert

Application Boundary

NO_2 1 hour Mean Process Contribution (μg/m³) SHBEC only

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: FINAL

Client: EP SHB

Project Title: SOUTH HUMBER BANK ENERGY CENTRE

Drawing Title: SHORT TERM MAXIMUM NO_2 PROCESS CONTRIBUTION 2014 METEOROLOGICAL YEAR FOR SHBEC ONLY AND FOR CUMULATIVE SCHEMES

Drawn	Checked	Approved	Date
JM	DD	GG	14/11/2018

AECOM Internal Project No.	Scale @ A3
60580855	1:6,000

AECOM
Royal Court,
Basil Close,
Chesterfield,
S41 7SL
Telephone (01246) 620 9221
www.aecom.com

Drawing Number: **FIGURE 7A-6**

Rev

File Name:C:\Users\joanna.morgan\Documents\ArcGIS\Koala\Figure7A-6.mxd

ANNEX B - ROAD TRAFFIC FLOW DATA

Traffic Data used in modelling of road emissions

Table B-1: 2017 Baseline Traffic Data

LINK	AADT (VEH/DAY)	%HDV	SPEED (MPH)
South Marsh Road (East of Hobson Way)[12]	780	26	30
South Marsh Road (West of Hobson Way)[12]	771	7	30
Hobson Way[12]	1,203	21	40
Kiln Lane[12]	2,815	35	40
A1173 (West of North Moss Lane)[12]	8,875	28	40
A1173 (North of A180)[12]	14,004	19	50
A180 North of A1173 (Eastbound)	11,786	21	60
A180 North of A1173 (Westbound)	13,884	20	60
A180 South of A1173 (Eastbound)	16,665	16	60
A180 South of A1173 (Westbound)	17,022	16	60

Table B-2: 2020 Base + Committed Development

LINK	AADT (VEH/DAY)	%HDV	SPEED (KPH)
South Marsh Road (East of Hobson Way)[12]	812	26	30
South Marsh Road (West of Hobson Way)[12]	802	7	30
Hobson Way[12]	1,253	21	40
Kiln Lane[12]	3,667	30	40
A1173 (West of North Moss Lane)[12]	9,706	29	40
A1173 (North of A180)[12]	16,208	18	50
A180 North of A1173 (Eastbound)	12,545	22	60
A180 North of A1173 (Westbound)	14,729	21	60

[12] These links have also been modelled as queues with a speed of 15 mph.

LINK	AADT (VEH/DAY)	%HDV	SPEED (KPH)
A180 South of A1173 (Eastbound)	17,830	16	60
A180 South of A1173 (Westbound)	18,202	16	60

Table B-3: 2020 Base + Committed + Peak Construction

LINK	AADT (VEH/DAY)	%HDV	SPEED (KPH)
South Marsh Road (East of Hobson Way)[12]	1,678	20	30
South Marsh Road (West of Hobson Way)[12]	877	7	30
Hobson Way[12]	2,044	19	40
Kiln Lane[12]	4,458	28	40
A1173 (West of North Moss Lane)[12]	10,497	28	40
A1173 (North of A180)[12]	16,992	18	50
A180 North of A1173 (Eastbound)	12,863	21	60
A180 North of A1173 (Westbound)	15,047	20	60
A180 South of A1173 (Eastbound)	17,904	16	60
A180 South of A1173 (Westbound)	18,276	16	60

Table B-4: 2022 Base + Committed Development

LINK	AADT (VEH/DAY)	%HDV	SPEED (KPH)
South Marsh Road (East of Hobson Way)[12]	833	26	30
South Marsh Road (West of Hobson Way)[12]	823	7	30
Hobson Way	1,286	21	40
Kiln Lane	3,917	33	40
A1173 (West of North Moss Lane)[12]	10,215	30	40
A1173 (North of A180)[12]	17,305	20	50
A180 North of A1173 (Eastbound)	13,064	23	60
A180 North of A1173 (Westbound)	15,306	21	60
A180 South of	18,423	16	60

A1173 (Eastbound)			
A180 South of A1173 (Westbound)	18,805	16	60

Table B-5: 2022 Base + Committed + Operation

LINK	AADT (VEH/DAY)	%HDV	SPEED (KPH)
South Marsh Road (East of Hobson Way)[12]	1,569	54	30
South Marsh Road (West of Hobson Way)[12]	875	7	30
Hobson Way[12]	1,971	45	40
Kiln Lane[12]	4,602	42	40
A1173 (West of North Moss Lane)[12]	10,900	34	40
A1173 (North of A180)[12]	17,987	23	50
A180 North of A1173 (Eastbound)	13,228	23	60
A180 North of A1173 (Westbound)	15,470	22	60
A180 South of A1173 (Eastbound)	18,599	17	60
A180 South of A1173 (Westbound)	18,981	17	60

ANNEX C - NITROGEN DIOXIDE DIFFUSION TUBE MONITORING RESULTS

Month 1: 29th June 2018 to 27th June 2018

Staffordshire County Council

the knot unites

UKAS TESTING 0719

To:

AECOM Infrastructure & Environment UK Ltd
Scott House
Alencon Link
BASINGSTOKE
Hampshire
RG21 7PP

REPORT

For the attention of: Joanna Morgan

Date : 14 August 2018
Site : Project Koala
NO_2 - Batch 1
Method : E/5049
Issue No. : 1

Lab Ref	Sample Details	Exposure Time Hours	*Nitrogen Dioxide (20°C) µg/m^3	Comments
10447852	KOA T1	671	9.0	-
10447853	KOA T2	671	16.8	-
10447854	KOA T3	670	13.2	-
10447855	KOA T4	670	14.2	-
10447856	KOA T5	670	22.0	-
10447857	KOA T6	670	17.4	-
10447858	KOA TB	672	< 1.0	-

Comments

The limit of detection for the laboratory method E/5049 is 0.050µg NO_2.

Mark Chapman
Testing Manager

Emma Loach
Laboratory Manager

Staffordshire Highways Laboratory
Sandyford Street
ST16 3NF

Tel: 01785 277360
E-mail: emma.loach@staffordshire.gov.uk
www.staffordshire.gov.uk

Month 2: 27th July 2018 to 24th August 2018

To:

AECOM Infrastructure &
Environment UK Ltd
Scott House
Alencon Link
BASINGSTOKE
Hampshire
RG21 7PP

REPORT

For the attention of: Joanna Morgan

Date : 5 September 2018
Site : Project Koala
NO2 - Batch 2
Method : E/5049
Issue No. : 1

Lab Ref	Sample Details	Exposure Time Hours	*Nitrogen Dioxide (20℃) µg/m^3	Comments
10449553	KOA T1	672	8.8	-
10449554	KOA T2	672	13.8	-
10449555	KOA T3	672	14.1	-
10449556	KOA T4	672	12.3	-
10449557	KOA T5	672	18.6	-
10449558	KOA T6	I/S	I/S	Tube missing
10449559	KOA TB	673	< 1.0	-

Comments

The limit of detection for the laboratory method E/5049 is 0.050µg NO2.

Emma Loach
Lab Manager

Emma Loach
Laboratory Manager

Staffordshire Highways Laboratory
Sandyford Street
ST16 3NF

Tel: 01785 277360
E-mail: emma.loach@staffordshire.gov.uk
www.staffordshire.gov.uk

Month 3: 24th August 2018 to 20th September 2018

To:

AECOM Infrastructure &
Environment UK Ltd
Scott House
Alencon Link
BASINGSTOKE
Hampshire
RG21 7PP

REPORT

For the attention of: Joanna Morgan

Date : 4 October 2018
Site : Project Koala
NO2 - Batch 3
Method : E/5049
Issue No. : 1

Lab Ref	Sample Details	Exposure Time Hours	*Nitrogen Dioxide (20℃) µg/m^3	Comments
10451034	KOA T1	648	11.5	cobweb
10451035	KOA T2	648	14.9	cobweb
10451036	KOA T3	648	15.2	cobweb
10451037	KOA T4	648	13.6	Spider
10451038	KOA T5	648	19.5	-
10451039	KOA T6	648	15.5	-
10451040	KOA TB	648	< 1.0	-

Comments

The limit of detection for the laboratory method E/5049 is 0.050µg NO2.

Emma Loach
Lab Manager

Emma Loach
Laboratory Manager

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ST16 3NF

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ANNEX D – ASSESSMENT OF CUMULATIVE IMPACTS

Introduction

This Annex reports the results of an assessment of cumulative impacts from the Proposed Development and other industrial emission sources in the vicinity of the Site. While the baseline data used in the assessment has captured the effect of existing emissions on local air quality concentrations, the measurements taken have not captured the process contribution made by consented but not yet operational developments in the local area, in particular the Vireol Plc Energy Park (DM/0329/18/FUL), North Beck Energy Centre (DM/0026/18/FUL), Energy Pyrolysis Plant (DM/0333/17/FUL), and VPI Immingham (PA/2018/918).

The South Humber Bank Power Station (SHBPS) adjacent to the Main Development Area is operational and the emissions of which will be captured within the baseline values from APIS, Defra and the measured nitrogen dioxide diffusion tube concentrations. Therefore inclusion of SHBPS in the cumulative modelling was not needed. However, SHBPS and the Proposed Development are located in close proximity to each other so there is the potential for 99.79^{th} percentile 1 hour NO_2 impacts to coincide in the same geographical location. Therefore separate analysis of this pollutant averaging period is displayed in the 'South Humber Bank Power Station' section below.

The future impact on ambient air quality of the Vireol Plc energy park, North Beck energy centre, Energy Pyrolysis Plant, and VPI Immingham, in combination with the Proposed Development been considered within this assessment of cumulative impacts, using dispersion modelling. As in the main assessment, the impacts presented are the maximum results obtained from modelling with 5 years of meteorological data.

Model Inputs

The model inputs for the additional emission sources are presented in this section. The model inputs for the Proposed Development are unchanged.

The Vireol Energy Park modelling information is sourced from the DM_0329_18_FUL-Air_Quality_Assessment-1382893 (Gair Consulting Ltd, 2018). The North Beck modelling information is sourced from the North Beck Energy Centre Appendix 8.2 Emissions Modelling (EP SHB Ltd., 2018). The Energy Pyrolysis modelling information was sourced from the DM_0333_17_FUL-AIR_QUALITY-ASSESSMENT (Earthcare Technical, 2017) chapter. However, no exact grid references for the sources were provided so AECOM used professional judgement to put these locations in the dispersion model. The VPI Immingham model input data was sourced from the Environmental Statement (AECOM, 2018). The SHBPS information was sourced from EP SHB Limited (EP SHB Limited, 2018). The location of these cumulative sites are displayed in Figure 7A-5.

All cumulative model schemes have been assumed to run continuously at full output. Table D-1 displays the model input data.

Table D-1: Summary of Stack Parameters for Vireol Plc, North Beck, Energy Pyrolysis, SHBPS and VPI Immingham

PARAMETER	VIREOL PLC EC	NORTH BECK	ENERGY PYROLYSIS					VPI IMMINGHAM	SHBPS
			PYR ENERGY GEN	PYR FLUE GAS	PYR REFINER STACK	PYR PELLETISER & DRYER	PYR TYRE PREP STACK		
Number of stacks	1	1	24	1	1	1	1	33	3 (A1, A2, A3)
Stack height (m)	65	90	12	14.5	14.5	14.5	14.5	10	75
Flue diameter (m)	2.27	3.3	0.2	0.4	0.3	0.4	0.9	0.37 per stack	A1: 5.6 A2 & A3: 7.9
Normalised volumetric flow rate (Nm^3/s)	39.8	124.91	1.11	3.1	1.05	Not provided	8.33	2.84 per stack	9.8 per stack
Reference conditions	273 K, 1 atmosphere, dry & 11% oxygen	273.15 K, dry gas, 11% oxygen	273 K, 5% O_2, dry, 101.3 kPa	273 K, 11% O_2, dry, 101.3 kPa	293.15 K, 20.95% O_2, 1% H_2O, 101.3 kPa	-	273 K, 20.95% O_2, 1% H_2O, 101.3 kPa	-	-
Actual Flow rate (Am^3/s)	61.0	173.12	4.17	3.38	1.41	3.11	9.4	39.5	-
Actual conditions	-	-	-	293 K, 11% O_2, dry, 101.3 kPa	393.15 K, 20.95% O_2, 1% H_2O, 101.3 kPa	380.35 K, 20.95% O_2, 15% H_2O,101.3 kPa	308.15 K, 20.95% O_2, 1% H_2O, 101.3 kPa	-	-
Actual Flow	-	-	-	-	-	3.11	14.8	-	-

PARAMETER	VIREOL PLC EC	NORTH BECK	ENERGY PYROLYSIS					VPI IMMINGHAM	SHBPS
			PYR ENERGY GEN	PYR FLUE GAS	PYR REFINER STACK	PYR PELLETISER & DRYER	PYR TYRE PREP STACK		
rate (m/s)									
Emission temperature (°C)	145	140	442	22.5	120	107.2	35	388	90
Grid Reference of Stack (X,Y)	523550,412401	520638,414600	520794, 414488 to 520816, 414540	520610, 414394	520618, 414352	520617, 414335	520753, 414430	516577, 417353 to 516558, 417307	A1: 522894, 413280 A2: 522903, 413247 A3: 522936, 413136
Particle emission rate (PM_{10}) (g/s)	0.40	0.535	-	0.03	0.005	0.003	0.08	-	-
NO_X (g/s)	8.0	10.7	0.28	0.62	-	-	-	0.27	A1: 12.06 A2 & A3: 24.01
SO_2 (g/s)	2.0	2.7	-	0.15	-	-	-	-	-
CO (g/s)	2.0	2.7	1.55	0.15	-	-	-	1.05	A1: 24.14 A2 & A3: 48.04
HF (g/s)	0.040	0.054	-	0.03	-	-	-	-	-
HCl (g/s)	0.40	0.535	-	0.03	-	-	-	-	-
TOC (g/s)	0.40	0.535	-	0.03	-	-	-	-	-

PARAMETER	VIREOL PLC EC	NORTH BECK	ENERGY PYROLYSIS					VPI IMMINGHAM	SHBPS
			PYR ENERGY GEN	PYR FLUE GAS	PYR REFINER STACK	PYR PELLETISER & DRYER	PYR TYRE PREP STACK		
Dioxins and Furans	4.0 x 10^{-9}	5.35 x 10^{-9}	-	3.72 x 10^{-10}	-	-	-	-	-
Cd & TI (g/s)	2.0 x 10^{-3}	3.0 x 10^{-3}	-	5.0 x 10^{-5}	-	-	-	-	-
Hg (g/s)	2.0 x 10^{-3}	3.0 x 10^{-3}	-	5.0 x 10^{-5}	-	-	-	-	-
Other metals (As, Cr, Co, Cu, Pb, Mn, Ni, Sb and V)	2.0 x 10^{-2}	2.7 x 10^{-2}	-	5.0 x 10^{-4}	-	-	-	-	-
PAH (as Benzo[a]pyrene)	3.6 x 10^{-6}	1.12 x 10^{-6}	-	3.72 x 10^{-6}	-	-	-	-	-
PCBs	-	2.68 x 10^{-6}	-	1.86 x 10^{-5}	-	-	-	-	-

A consideration of building downwash effects has been made by including information on building dimensions associated with the Vireol Plc energy centre, North Beck energy centre, Energy Pyrolysis, VPI Immingham and SHBPS within the model. The building dimensions are presented in Table D-2

Table D-2: Building Parameters – Vireol Plc, North Beck, Energy Pyrolysis, VPI Immingham and SHBPS

SITE	BUILDING	NATIONAL GRID REFERENCE OF CENTRE POINT (X,Y)	LENGTH (m)	WIDTH (m)	HEIGHT (m)	ANGLE (^{O})
Vireol Plc EC	Vireol Plc Bld 1	523524, 412452	95	220	19.3	46
	Vireol Plc Bld 2	523515, 412467	95	22	32.4	317
	Vireol Plc Bld 3	523534, 412474	80	14	25.6	317
North Beck	NB Boiler House	520722, 414663	45.5	55	48	53
	NB Flue Gas TH	520673, 414626	78	55	48	53
	NB Bunker	520759, 414691	78	55	48	53
	NB Waste Reception	520793, 414712	35	83.7	26.6	53
	NB TH	520747, 414627	40	32	24	53
	NB ACC	520679, 414567	74	26	20	53
Energy Pyrolysis	Pyrolysis Main Bld	520678, 414373	182.92	70.86	13.5	57.02
VPI Immingham	VPI Generator Housin	516565, 417338	65	80	7	60
	VPI Main Site	516718, 417296	130	35	22	60
	VPI Workshop	516586, 417397	30	15	10	60
	VPI Water Tank	516614, 417357	12	12	10	Circular shape
	VPI Transformer	516607, 417372	16	12	10	60
	VPI Gas Receiving Co	516622, 417339	25	20	7	60
SHBPS	Turbine Building 1	522906, 413145	30.7	73.6	85.6	74.2
	Turbine Building 2	522874, 413372	29.7	82.3	115.4	74.6

Model Results

The results of the cumulative impact modelling is presented in the Tables below. The maximum predicted impact location from each individual facility will vary spatially due to their different position within the model domain and source characteristics. The maximum impact from all the modelled sources will include a contribution from each individual source and may not occur at the same location as individual maximum impacts.

The change in annual mean NO_2 concentrations at the selected discrete receptors is shown in Table D-3. The highest combined PC of 1.1 µg/m^3 is predicted to occur at R1, R7 and R8 (Table D-3). No annual mean concentration above the annual mean Environmental Standard for NO_2 is predicted to occur, even at the selected receptors (Table D-3).

The maximum combined impact within the modelled domain, due to the operation of the Proposed Development, Vireol Plc energy centre, North Beck energy centre, Energy Pyrolysis and VPI Immingham are shown in Table D-5. With six exceptions, the modelled PECs are all within the Environmental Standards for the protection of human health. As in the assessment of impacts of the Proposed Development alone, the assumption of worst case emission rates for result in predicted combined PC values in excess of the Environmental Standard., due almost entirely to the estimated baseline concentration exceeding the Environmental Standard.

Further analysis of Cr(VI), nickel, arsenic and Benzo[a]pyrene was therefore undertaken later in this section.

The assessment results show that the predicted impacts at ecological receptors are within the criteria for insignificance at most of the selected receptors. A PC of more than 1% of the long term critical load has been predicted to occur at the following designated site, in an area which already exceeds the relevant standard:

- Humber Estuary (Acid Fixed Dunes), in respect of acid deposition.

At the acid fixed dunes, the cumulative PC to acid deposition is 1.5% of the lower range critical load. The PC from the Proposed Development alone was 0.6% of the lower range critical load. The cumulative effect of acid deposition on the Dune habitat has been considered in detail in the report to inform the HRA Signposting (see Appendix 10G in ES Volume III). Please refer to the Ecology Chapter 10 for discussion about the significance of the in combination emissions on sensitive ecological receptors.

Table D-3: Predicted Change in Annual Mean NO_2 Concentrations at Discrete Receptors (µg/m^3) due to operational point sources and traffic Emissions from the Proposed Development, Vireol Plc, North Beck, Energy Pyrolysis and VPI Immingham with Comparison against Environmental Standard Criteria

RECEPTOR	BACKGROUND	CHANGE DUE TO ROAD	COMBINED PC FROM POINT SOURCE EMISSIONS	COMBINED CHANGE % ENV STD	PEC	PEC % ENV STD
R1	11.8	+0.4	+0.7	2.7	21.1	52.7
R2	11.8	+0.3	+0.6	2.4	17.8	44.5
R3	11.8	+0.3	+0.7	2.4	18.0	45.0
R4	11.8	+0.4	+0.6	2.4	20.2	50.5
R5	11.8	+0.4	+0.6	2.4	21.0	52.5
R6	11.8	+0.4	+0.6	2.5	23.7	59.3
R7	11.8	+0.5	+0.6	2.7	27.2	68.0
R8	11.8	+0.6	+0.6	2.8	30.8	77.1
R9	11.8	+0.3	+0.5	2.0	21.2	52.9
R10	11.8	+0.2	+0.5	1.8	18.3	45.7
R11	11.8	+0.2	+0.5	1.7	17.6	44.0
R12	11.8	+0.3	+0.5	1.8	18.3	45.7
R13	11.8	+0.2	+0.2	1.1	19.9	49.8
R14	11.8	+0.2	+0.8	2.5	15.9	39.8
R15	11.8	+0.1	+0.6	1.9	15.9	39.8
R16	11.8	+0.2	+0.6	1.9	17.2	42.9
R17	11.8	+0.2	+0.5	1.8	18.4	46.1
R18	11.8	+0.2	+0.4	1.5	20.9	52.2
R19	11.8	+0.2	+0.2	0.8	18.8	47.0
R20	11.8	+0.4	+0.2	1.4	32.6	81.4
R21	37.3	+<0.1	+0.2	0.5	37.8	94.5

Table D-4: Predicted Change in Annual Mean PM_{10} Concentrations at Receptors from the Proposed Development, Vireol Plc, North Beck, and Energy Pyrolysis, with Comparison against Environmental Standard Criteria

RECEPTOR	BACKGROUND	CHANGE DUE TO ROAD	COMBINED PC FROM POINT SOURCE EMISSIONS	PC % ENV STD	PEC	PEC % ENV STD
R1	15.6	+<0.1	+<0.1	<1	15.7	39.3
R2	15.6	+<0.1	+<0.1	<1	15.7	39.3
R3	15.6	+<0.1	+<0.1	<1	15.7	39.3
R4	15.6	+<0.1	+<0.1	<1	15.7	39.3
R5	15.6	+0.1	+<0.1	<1	15.7	39.3
R6	15.6	+0.1	+<0.1	<1	15.7	39.3
R7	15.6	+0.1	+<0.1	<1	15.8	39.4
R8	15.6	+0.1	+<0.1	<1	15.8	39.4
R9	15.6	+<0.1	+<0.1	<1	15.7	39.3
R10	15.6	+<0.1	+<0.1	<1	15.7	39.3
R11	15.6	+<0.1	+<0.1	<1	15.7	39.2
R12	15.6	+<0.1	+<0.1	<1	15.7	39.3
R13	15.6	+<0.1	+<0.1	<1	15.7	39.2
R14	15.6	+<0.1	+<0.1	<1	15.7	39.2
R15	15.6	+<0.1	+<0.1	<1	15.7	39.2
R16	15.6	+<0.1	+<0.1	<1	15.7	39.2
R17	15.6	+<0.1	+<0.1	<1	15.7	39.2
R18	15.6	+<0.1	+<0.1	<1	15.7	39.2
R19	15.6	+<0.1	+<0.1	<1	15.7	39.2
R20	15.6	+0.1	+<0.1	<1	15.7	39.3
R21	15.6	+<0.1	+<0.1	<1	15.7	39.1

Table D-5: Maximum Process Contribution from the Proposed Development, Vireol Plc, North Beck and Energy Pyrolysis Predicted Environmental Concentration, all Modelled Pollutants, for the Worst Case Meteorological Year

POLLUTANT	AVERAGING PERIOD	BACKGROUND ($\mu g/m^3$)	ENV STD	COMBINED PC	COMBINED PC % ENV STD	TOTAL PEC	TOTAL PEC% ENV STD
NO_2	Annual Mean[13]	18.2	40	27.1	67.7	38.9	97
	99.79th %ile of 1-hour means	36.4	200	74.6	37.3	98.2	49
PM_{10}	Annual Mean	15.6	40	1.3	3	17.0	42
	90.41st %ile of 24-hour means	23.5	50	2.9	6	26.4	53
$PM_{2.5}$	Annual Mean	10.7	25	1.3	5	12.0	48
SO_2	Annual Mean	16.7	50	1.2	2	17.9	36
	99.9th %le of 15-min means	33.4	266	19.5	7	52.9	20
	99.73rd %ile of 1-hour means	33.4	350	15.3	4	48.7	14
	99.18th %ile of 24-hour means	33.4	125	7.1	6	40.5	32
VOC, as Benzene	Annual Mean	0.368	5	0.3	5	0.6	13

[13] Annual mean NO_2 PC is for the Proposed Development, Vireol Plc, North Beck and Energy Pyrolysis

POLLUTANT	AVERAGING PERIOD	BACKGROUND (µg/m³)	ENV STD	COMBINED PC	COMBINED PC % ENV STD	TOTAL PEC	TOTAL PEC% ENV STD
CO	Max daily 8-hr running mean	258	10000	1569.2	16	1827.2	18
HCl	Max 1-hour mean	0.2	750	5.2	1	5.4	1
HF	Monthly mean	0.003	16	0.5	3	0.5	3
	Max 1-hour mean	0.006	160	0.5	0	0.5	0
PAH (as BaP)	Annual Mean	0.00082	0.00025	0.00026	105	0.0011	434
Pb	Annual Mean	1.85×10^{-01}	0.25	6.12×10^{-03}	2	0.2	76
Cd	Annual Mean	0.00047	0.005	0.0086	171	0.0090	181
Hg	Annual Mean	0.002	0.25	0.0086	3	0.011	4
	Max 1-hr mean	0.004	7.5	0.0081	0.1	0.012	0
Sb	Annual Mean	0.00078	5	0.061	0.1	0.01	0.1
	Max 1-hr mean	0.0016	150	0.099	0.1	0.1	0.1
As	Annual Mean	0.001	0.003	0.006	204	0.0071	238
Total Cr	Annual Mean	0.004	5	0.0061	0.1	0.01	0.2
	Max 1-hr Mean	0.008	150	0.099	0.1	0.1	0.1
Cr (VI) oxidation state in PM_{10} fraction	Annual Mean	0.00080	0.0002	0.0061	3061	0.0069	3463
Cu (dusts and mists)	Annual Mean	0.006	10	0.0061	0.1	0.01	0.1
	Max 1-hr mean	0.011	200	0.099	<0.1	0.1	0.1

POLLUTANT	AVERAGING PERIOD	BACKGROUND (µg/m^3)	ENV STD	COMBINED PC	COMBINED PC % ENV STD	TOTAL PEC	TOTAL PEC% ENV STD
Mn	Annual Mean	0.11	0.15	0.0061	4	0.1	75
	Max 1-hr mean	0.21	1500	0.099	0.01	0.3	0.02
Ni	Annual Mean	0.001	0.02	0.0061	31	0.01	37
V	Annual Mean	0.01	5	0.0061	0.1	0.02	0
	Max 1-hour mean	0.02	1	0.099	10	0.1	12
Dioxins and Furans	Annual Mean	1.20×10^{-5}	-	2.90×10^{-9}		1.20×10^{-5}	

Additional Consideration of Group 3 Metals Using EA Guidance

The EA has released guidance on the assessment of Group 3 metals in light of the revised lower Environmental Standard for arsenic, nickel and chromium (VI). As arsenic, nickel and chromium (VI) have PECs above their respective Environmental Standards when modelled on a worst-case screening basis, these metals are considered further following this guidance.

The second step in the assessment is to revise the predicted impacts using emissions data which have been measured by the EA at municipal waste incinerators. Table D-6 presents the revised PC and PEC values within the modelled domain, for arsenic, nickel and chromium (VI) using the mean, maximum and minimum emission concentrations provided by the EA guidance.

The results show that the mean and minimum PC for Cr(VI), As and Ni can be are less than 1% of the Environmental Standard so they can be screened out as insignificant. The maximum As and Ni values gives a predicted PC greater than 1% of the Environmental Standard, however the PEC is well below the Environmental Standard. The maximum Cr(VI) PC is 1.8% of the Environmental Standard, and occurs in a similar location to the maximum predicted annual mean impact from the Proposed Development alone, at national grid reference 523480, 414010 which is in the Humber Estuary some 200 metres from the nearest landmass. The annual mean isoline plot (Figure 7A-3) shows that impacts on land would be less than half the maximum and it is therefore concluded that the contribution to cumulative annual mean Cr(VI) concentrations made by the Proposed Development would not be significant.

Table D-6: Maximum Process Contribution and Predicted Environmental Concentration, for As and Cr (VI) for all cumulative developments, for the Worst Case Meteorological Year

POLLUTANT		AVERAGING PERIOD	ENV STD (µg/m^3)	TOTAL PC	PC % ENV STD	PEC	PEC % ENV STD
Cr (VI)	Mean emissions	Annual Mean	0.0002	9.83×10^{-7}	0.5	8.05×10^{-4}	402
	Max emissions	Annual Mean	0.0002	3.65×10^{-6}	1.8	8.08×10^{-4}	404
	Min emissions	Annual Mean	0.0002	6.46×10^{-8}	0.03	8.04×10^{-4}	402
As	Mean emissions	Annual Mean	0.003	2.81×10^{-5}	0.9	1.04×10^{-3}	35
	Max emissions	Annual Mean	0.003	7.01×10^{-4}	23.4	1.71×10^{-3}	57
	Min emissions	Annual Mean	0.003	5.61×10^{-6}	0.2	1.02×10^{-3}	34
Ni	Mean emissions	Annual Mean	0.02	4.21×10^{-4}	2.1	1.64×10^{-3}	8
	Max emissions	Annual Mean	0.02	6.16×10^{-3}	30.8	7.38×10^{-3}	37
	Min emissions	Annual Mean	0.02	7.01×10^{-5}	0.4	1.29×10^{-3}	6

Additional Consideration of Benzo[a]Pyrene Emissions

The results presented in Table D-75 showed that the need for more detailed consideration of Benzo[a]Pyrene, as the initial assumption that all emissions of PAH from the Proposed Development are composed of benzo[a]pyrene, combined with the assumption that the emission occurs continuously at the ELV, results in a PEC of more than the annual mean Environmental Standard, when combined with the measured background concentration.

Benzo[a]pyrene emissions have been considered using emission rates derived from total benzo[a]pyrene concentrations measured at a UK waste incineration facility in Sheffield. This provides a more realistic basis for assessment, based on emissions from comparable processes to those assessed here.

The PC of the Environmental Standard is 11.4% which is still potentially significant. However, this maximum contribution is located at national grid reference 520700, 414550 near to the North Beck and Energy Pyrolysis facilities, 2.5 kilometres north-west of the Proposed Development. The PC from the Proposed Development at the same place to annual mean B[a]P concentrations is 8.2 x 10^{-9} µg/m^3. It is therefore concluded that the emissions from the Proposed Development would not make a significant cumulative contribution to B[a]P concentrations at this location.

Table D-7: Predicted Total Process Contribution for all the cumulative schemes and Predicted Environmental Concentration, for B[a]P, for the Worst Case Meteorological Data Year, using a measured Emissions Concentration

POLLUTANT	AVERAGING PERIOD	ENV STD (µg/m^3)	PC	PC % ENV STD	PEC	PEC % ENV STD
B[a]P	Annual Mean	2.5 x 10^{-4}	0.00003	11.4	8.52 x 10^{-4}	341

Table D-8: Proposed Development, Vireol Plc, North Beck and Energy Pyrolysis Combined Impact on Sensitive Ecological Receptors - NO_X

RECEPTOR ID	SITE NAME & LAND USE TYPE	ANNUAL MEAN (µg/m³)[14]						24 HOUR MEAN (µg/m³)					
		BKGD (µg/m³)	CRITICAL LEVEL	COMBINED PC	PC/CL	PEC	PEC/CL	BKGD (µg/m³)	CRITICAL LEVEL	COMBINED PC	PC/CL	PEC	PEC/CL
E1_1	Humber Estuary (Atlantic Salt Meadows)	29.2	30	2.2	7.2	19.3	104	64.3	75	15.2	20.3	59.0	79
E1_2	Humber Estuary (Atlantic Salt Meadows)	29.2	30	2.0	6.8	19.1	104	63.6	75	15.1	20.1	58.9	79
E1_3	Humber Estuary (Atlantic Salt Meadows)	29.2	30	2.3	7.6	19.4	105	64.7	75	14.6	19.5	58.4	78
E2_1	Humber Estuary (Atlantic Salt Meadows)	27.3	30	0.5	1.6	27.8	93	41.0	75	5.4	7.2	46.4	62
E2_2	Humber Estuary (Atlantic Salt Meadows)	28.7	30	0.5	1.5	29.1	97	43.1	75	5.1	6.8	48.1	64
E2_3	Humber Estuary (Atlantic Salt Meadows)	28.7	30	0.4	1.4	29.1	97	43.1	75	5.0	6.6	48.0	64
E2_4	Humber Estuary (Atlantic Salt Meadows)	28.7	30	0.4	1.4	29.1	97	43.1	75	4.6	6.1	47.6	63
E3_1	Humber Estuary	37.1	30	0.4	1.2	37.4	125	55.7	75	3.6	4.8	59.2	79

[14] This includes PC from VPI Immingham

RECEPTOR ID	SITE NAME & LAND USE	ANNUAL MEAN (µg/m^3)[14]						24 HOUR MEAN (µg/m^3)					
	(Atlantic Salt Meadows)												
E4_1	Humber Estuary (Acid Fixed Dunes)	22.8	30	0.2	0.6	22.9	76	34.1	75	1.8	2.4	35.9	48
E4_2	Humber Estuary (Acid Fixed Dunes)	22.8	30	0.2	0.6	22.9	76	34.1	75	1.7	2.3	35.9	48
E4_3	Humber Estuary (Acid Fixed Dunes)	22.8	30	0.2	0.6	22.9	76	34.1	75	1.7	2.3	35.8	48
E4_4	Humber Estuary (Acid Fixed Dunes)	22.8	30	0.2	0.6	22.9	76	34.1	75	1.7	2.2	35.8	48
E4_5	Humber Estuary (Acid Fixed Dunes)	21.2	30	0.2	0.6	21.4	71	31.8	75	1.7	2.2	33.5	45
E4_6	Humber Estuary (Acid Fixed Dunes)	21.2	30	0.2	0.6	21.4	71	31.8	75	1.6	2.2	33.5	45
E5_1	Humber Estuary (Atlantic Salt Meadows)	22.8	30	0.2	0.6	22.9	76	34.1	75	1.7	2.3	35.8	48
E5_2	Humber Estuary (Atlantic Salt Meadows)	21.2	30	0.2	0.6	21.4	71	31.8	75	1.7	2.3	33.5	45
E5_3	Humber Estuary (Atlantic Salt Meadows)	21.2	30	0.2	0.6	21.4	71	31.8	75	1.7	2.2	33.5	45
E5_4	Humber Estuary (Atlantic Salt Meadows)	21.2	30	0.2	0.5	21.4	71	31.8	75	1.6	2.2	33.4	45

RECEPTOR ID	SITE NAME & LAND USE	ANNUAL MEAN ($\mu g/m^3$)[14]						24 HOUR MEAN ($\mu g/m^3$)					
E5_5	Humber Estuary (Atlantic Salt Meadows)	21.2	30	0.2	0.5	21.4	71	31.8	75	1.6	2.1	33.4	45
E5_6	Humber Estuary (Atlantic Salt Meadows)	19.6	30	0.2	0.5	19.7	66	29.3	75	1.6	2.1	30.9	41
E5_7	Humber Estuary (Atlantic Salt Meadows)	19.6	30	0.2	0.5	19.7	66	29.3	75	1.5	2.1	30.9	41
E5_8	Humber Estuary (Atlantic Salt Meadows)	19.6	30	0.2	0.5	19.7	66	29.3	75	1.5	2.0	30.8	41
E5_9	Humber Estuary (Atlantic Salt Meadows)	19.6	30	0.1	0.5	19.7	66	29.3	75	1.5	2.0	30.8	41
E5_10	Humber Estuary (Atlantic Salt Meadows)	19.6	30	0.1	0.5	19.7	66	29.3	75	1.4	1.9	30.7	41
E6_1	Laporte Road (neutral grassland)	30.3	30	5.5	18.3	35.6	119	45.4	75	28.5	38.0	73.9	98
E6_2	Laporte Road (neutral grassland)	30.3	30	5.2	17.4	35.3	118	45.4	75	29.3	39.0	74.6	100
E7_1	Stallingborough Fish Bonds (Broadleaved, mixed and yew woodland)	25.0	30	0.9	3.0	25.8	86	37.5	75	8.6	11.5	46.1	61
E7_2	Stallingborough Fish Bonds (Broadleaved,	25.0	30	0.9	2.9	25.8	86	37.5	75	8.0	10.7	45.5	61

RECEPTOR ID	SITE NAME & LAND USE	ANNUAL MEAN (µg/m^3)[14]						24 HOUR MEAN (µg/m^3)					
	mixed and yew woodland)												
E8_1	Healing Cress Beds (broadleaved, mixed and yew woodland)	24.0	30	0.9	3.1	24.8	83	35.9	75	8.7	11.6	44.6	60
E8_2	Healing Cress Beds (broadleaved, mixed and yew woodland)	24.0	30	0.9	3.1	24.8	83	35.9	75	8.2	10.9	44.1	59
E9_1	Sweedale Croft Drain (Fen, Marsh and Swamp)	31.2	30	0.6	2.0	31.7	106	46.8	75	8.5	11.4	55.3	74
E9_2	Sweedale Croft Drain (Fen, Marsh and Swamp)	31.2	30	0.6	2.0	31.7	106	46.8	75	10.5	14.0	57.3	76
E9_3	Sweedale Croft Drain (Fen, Marsh and Swamp)	31.2	30	0.6	1.9	31.7	106	46.8	75	8.7	11.6	55.4	74

Table D-9: Proposed Development, Vireol Plc, North Beck and Energy Pyrolysis Combined Impact on Sensitive Ecological Receptors - SO_2

RECEPTOR ID	SITE NAME & LAND USE TYPE	ANNUAL MEAN (µg/m^3)					
		BKGD (µg/m^3)	CRITICAL LEVEL	COMBINED PC	PC/CL	PEC	PEC/CL
E1_1	Humber Estuary (Atlantic	4.9	20	0.5	2.4	5.3	27

RECEPTOR ID	SITE NAME & LAND USE TYPE	ANNUAL MEAN (µg/m^3)					
	Salt Meadows)						
E1_2	Humber Estuary (Atlantic Salt Meadows)	4.9	20	0.5	2.3	5.3	27
E1_3	Humber Estuary (Atlantic Salt Meadows)	4.9	20	0.5	2.5	5.4	27
E2_1	Humber Estuary (Atlantic Salt Meadows)	6.4	20	0.1	0.4	6.5	32
E2_2	Humber Estuary (Atlantic Salt Meadows)	4.6	20	0.1	0.4	4.7	23
E2_3	Humber Estuary (Atlantic Salt Meadows)	4.6	20	0.1	0.4	4.7	23
E2_4	Humber Estuary (Atlantic Salt Meadows)	4.6	20	0.1	0.4	4.7	23
E3_1	Humber Estuary (Atlantic Salt Meadows)	4.3	20	0.1	0.3	4.4	22
E4_1	Humber Estuary (Acid Fixed Dunes)	2.7	20	0.03	0.1	2.8	14
E4_2	Humber Estuary (Acid Fixed Dunes)	2.7	20	0.03	0.1	2.8	14
E4_3	Humber Estuary (Acid Fixed Dunes)	2.7	20	0.03	0.1	2.8	14
E4_4	Humber Estuary (Acid Fixed Dunes)	2.7	20	0.03	0.1	2.8	14
E4_5	Humber Estuary (Acid Fixed Dunes)	2.6	20	0.03	0.1	2.6	13
E4_6	Humber Estuary (Acid Fixed Dunes)	2.6	20	0.03	0.1	2.6	13
E5_1	Humber Estuary (Atlantic Salt Meadows)	2.7	20	0.03	0.1	2.8	14
E5_2	Humber Estuary (Atlantic Salt Meadows)	2.6	20	0.03	0.1	2.6	13
E5_3	Humber Estuary (Atlantic	2.6	20	0.03	0.1	2.6	13

RECEPTOR ID	SITE NAME & LAND USE TYPE	ANNUAL MEAN (µg/m³)					
	Salt Meadows)						
E5_4	Humber Estuary (Atlantic Salt Meadows)	2.6	20	0.03	0.1	2.6	13
E5_5	Humber Estuary (Atlantic Salt Meadows)	2.6	20	0.03	0.1	2.6	13
E5_6	Humber Estuary (Atlantic Salt Meadows)	2.6	20	0.02	0.1	2.6	13
E5_7	Humber Estuary (Atlantic Salt Meadows)	2.6	20	0.02	0.1	2.6	13
E5_8	Humber Estuary (Atlantic Salt Meadows)	2.6	20	0.02	0.1	2.6	13
E5_9	Humber Estuary (Atlantic Salt Meadows)	2.6	20	0.02	0.1	2.6	13
E5_10	Humber Estuary (Atlantic Salt Meadows)	2.6	20	0.02	0.1	2.6	13
E6_1	Laporte Road (neutral grassland)	3.7	20	0.2	1.2	4.0	20
E6_2	Laporte Road (neutral grassland)	3.7	20	0.2	1.2	4.0	20
E7_1	Stallingborough Fish Bonds (Broadleaved, mixed and yew woodland)	3.7	20	0.1	0.7	3.9	19
E7_2	Stallingborough Fish Bonds (Broadleaved, mixed and yew woodland)	3.7	20	0.1	0.7	3.9	19
E8_1	Healing Cress Beds (broadleaved, mixed and yew woodland)	3.7	20	0.2	0.9	3.9	20
E8_2	Healing Cress Beds (broadleaved, mixed and yew woodland)	3.7	20	0.2	0.9	3.9	20
E9_1	Sweedale Croft Drain (Fen,	3.7	20	0.1	0.6	3.8	19

RECEPTOR ID	SITE NAME & LAND USE TYPE	ANNUAL MEAN (µg/m^3)					
	Marsh and Swamp)						
E9_2	Sweedale Croft Drain (Fen, Marsh and Swamp)	3.7	20	0.1	0.6	3.8	19
E9_3	Sweedale Croft Drain (Fen, Marsh and Swamp)	3.7	20	0.1	0.5	3.8	19

Table D-10: Proposed Development, Vireol Plc and North Beck Combined Impacts on Sensitive Ecological Receptors - NH_3

RECEPTOR ID	SITE NAME & LAND USE TYPE	ANNUAL MEAN (µg/m^3)					
		BKGD (µg/m^3)	CRITICAL LEVEL	COMBINED PC	PC/CL	PEC	PEC/CL
E1_1	Humber Estuary (Atlantic Salt Meadows)	1.2	3	0.09	3.0	1.3	44
E1_2	Humber Estuary (Atlantic Salt Meadows)	1.2	3	0.09	2.9	1.3	44
E1_3	Humber Estuary (Atlantic Salt Meadows)	1.2	3	0.09	3.1	1.3	44
E2_1	Humber Estuary (Atlantic Salt Meadows)	0.0	3	0.02	0.6	0.0	1
E2_2	Humber Estuary (Atlantic Salt Meadows)	0.0	3	0.02	0.6	0.0	1
E2_3	Humber Estuary (Atlantic Salt Meadows)	0.0	3	0.01	0.5	0.0	0
E2_4	Humber Estuary (Atlantic Salt Meadows)	0.0	3	0.01	0.5	0.0	0
E3_1	Humber Estuary (Atlantic Salt Meadows)	0.0	3	0.01	0.4	0.0	0
E4_1	Humber Estuary (Acid Fixed Dunes)	0.9	3	0.01	0.2	0.9	30
E4_2	Humber Estuary (Acid Fixed Dunes)	0.9	3	0.01	0.2	0.9	30
E4_3	Humber Estuary (Acid Fixed Dunes)	0.9	3	0.006	0.2	0.9	30
E4_4	Humber Estuary (Acid Fixed Dunes)	0.9	3	0.006	0.2	0.9	30
E4_5	Humber Estuary (Acid Fixed Dunes)	0.9	3	0.006	0.2	0.9	30
E4_6	Humber Estuary (Acid Fixed Dunes)	0.9	3	0.006	0.2	0.9	30
E5_1	Humber Estuary (Atlantic Salt Meadows)	0.9	3	0.006	0.2	0.9	30
E5_2	Humber Estuary (Atlantic Salt Meadows)	0.9	3	0.006	0.2	0.9	30
E5_3	Humber Estuary (Atlantic Salt Meadows)	0.9	3	0.006	0.2	0.9	30

RECEPTOR ID	SITE NAME & LAND USE TYPE	ANNUAL MEAN (µg/m³)					
E5_4	Humber Estuary (Atlantic Salt Meadows)	0.9	3	0.006	0.2	0.9	30
E5_5	Humber Estuary (Atlantic Salt Meadows)	0.9	3	0.005	0.2	0.9	30
E5_6	Humber Estuary (Atlantic Salt Meadows)	0.9	3	0.005	0.2	0.9	30
E5_7	Humber Estuary (Atlantic Salt Meadows)	0.9	3	0.005	0.2	0.9	30
E5_8	Humber Estuary (Atlantic Salt Meadows)	0.9	3	0.005	0.2	0.9	30
E5_9	Humber Estuary (Atlantic Salt Meadows)	0.9	3	0.005	0.2	0.9	30
E5_10	Humber Estuary (Atlantic Salt Meadows)	0.9	3	0.005	0.2	0.9	30
E6_1	Laporte Road (neutral grassland)	1.2	3	0.03	1.1	1.3	42
E6_2	Laporte Road (neutral grassland)	1.2	3	0.03	1.1	1.3	42
E7_1	Stallingborough Fish Bonds (Broadleaved, mixed and yew woodland)	1.2	3	0.04	1.2	1.3	42
E7_2	Stallingborough Fish Bonds (Broadleaved, mixed and yew woodland)	1.2	3	0.04	1.2	1.3	42
E8_1	Healing Cress Beds (broadleaved, mixed and yew woodland)	1.2	3	0.04	1.4	1.3	42
E8_2	Healing Cress Beds (broadleaved, mixed and yew woodland)	1.2	3	0.04	1.3	1.3	42
E9_1	Sweedale Croft Drain (Fen, Marsh and Swamp)	1.2	3	0.02	0.7	1.3	42
E9_2	Sweedale Croft Drain (Fen, Marsh and Swamp)	1.2	3	0.02	0.7	1.3	42
E9_3	Sweedale Croft Drain (Fen, Marsh and Swamp)	1.2	3	0.02	0.7	1.3	42
Energy Pyrolysis and VPI Immingham do not release NH_3.							

Table D-11: Proposed development, Vireol Plc, North Beck and Energy Pyrolysis Combined Impact on Sensitive Ecological Receptors - HF

RECEPTOR ID	SITE NAME & LAND USE TYPE	24 HOUR MEAN (µg/m³)						168 HOUR MEAN (µg/m³)					
		BKGD (µg/m³)	CRITICAL LEVEL	COMBINED PC	PC/CL	PEC	PEC/CL	BKGD (µg/m³)	CRITICAL LEVEL	COMBINED PC	PC/CL	PEC	PEC/CL
E1_1	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.1	2.1	0.1	2	0.006	0.5	0.04	7.1	0.04	8

RECEPTOR ID	SITE NAME & LAND USE	24 HOUR MEAN (µg/m^3)						168 HOUR MEAN (µg/m^3)					
E1_2	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.1	2.1	0.1	2	0.006	0.5	0.04	7.2	0.04	8
E1_3	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.1	2.1	0.1	2	0.006	0.5	0.04	7.9	0.05	9
E2_1	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.03	0.6	0.04	1	0.006	0.5	0.01	2.9	0.02	4
E2_2	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.03	0.6	0.03	1	0.006	0.5	0.01	2.8	0.02	4
E2_3	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.03	0.6	0.03	1	0.006	0.5	0.01	2.6	0.02	4
E2_4	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.03	0.5	0.03	1	0.006	0.5	0.01	2.5	0.02	4
E3_1	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.02	0.4	0.03	1	0.006	0.5	0.01	2.0	0.02	3
E4_1	Humber Estuary (Acid Fixed Dunes)	0.006	5	0.01	0.2	0.02	0	0.006	0.5	0.004	0.9	0.01	2
E4_2	Humber Estuary (Acid Fixed Dunes)	0.006	5	0.01	0.2	0.01	0	0.006	0.5	0.004	0.9	0.01	2
E4_3	Humber Estuary (Acid Fixed Dunes)	0.006	5	0.01	0.2	0.01	0	0.006	0.5	0.004	0.9	0.01	2
E4_4	Humber Estuary (Acid Fixed	0.006	5	0.01	0.2	0.01	0	0.006	0.5	0.004	0.9	0.01	2

RECEPTOR ID	SITE NAME & LAND USE	24 HOUR MEAN (µg/m³)						168 HOUR MEAN (µg/m³)					
	Dunes)												
E4_5	Humber Estuary (Acid Fixed Dunes)	0.006	5	0.01	0.2	0.01	0	0.006	0.5	0.004	0.9	0.01	2
E4_6	Humber Estuary (Acid Fixed Dunes)	0.006	5	0.01	0.2	0.01	0	0.006	0.5	0.004	0.9	0.01	2
E5_1	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.01	0.2	0.01	0	0.006	0.5	0.004	0.8	0.01	2
E5_2	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.01	0.2	0.01	0	0.006	0.5	0.004	0.8	0.01	2
E5_3	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.01	0.2	0.01	0	0.006	0.5	0.004	0.8	0.01	2
E5_4	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.01	0.2	0.01	0	0.006	0.5	0.004	0.8	0.01	2
E5_5	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.01	0.2	0.01	0	0.006	0.5	0.004	0.8	0.01	2
E5_6	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.01	0.2	0.01	0	0.006	0.5	0.004	0.8	0.01	2
E5_7	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.01	0.2	0.01	0	0.006	0.5	0.004	0.8	0.01	2
E5_8	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.01	0.2	0.01	0	0.006	0.5	0.004	0.8	0.01	2
E5_9	Humber Estuary	0.006	5	0.01	0.2	0.01	0	0.006	0.5	0.004	0.7	0.01	2

RECEPTOR ID	SITE NAME & LAND USE	24 HOUR MEAN (µg/m^3)						168 HOUR MEAN (µg/m^3)					
	(Atlantic Salt Meadows)												
E5_10	Humber Estuary (Atlantic Salt Meadows)	0.006	5	0.01	0.1	0.01	0	0.006	0.5	0.004	0.7	0.01	2
E6_1	Laporte Road (neutral grassland)	0.006	5	0.03	0.7	0.04	1	0.006	0.5	0.02	3.1	0.02	4
E6_2	Laporte Road (neutral grassland)	0.006	5	0.03	0.7	0.04	1	0.006	0.5	0.01	2.9	0.02	4
E7_1	Stallingborough Fish Bonds (Broadleaved, mixed and yew woodland)	0.006	5	0.04	0.9	0.05	1	0.006	0.5	0.02	4.2	0.03	5
E7_2	Stallingborough Fish Bonds (Broadleaved, mixed and yew woodland)	0.006	5	0.05	0.9	0.05	1	0.006	0.5	0.02	4.4	0.03	6
E8_1	Healing Cress Beds (broadleaved, mixed and yew woodland)	0.006	5	0.1	1.4	0.08	2	0.006	0.5	0.03	7.0	0.04	8
E8_2	Healing Cress Beds (broadleaved, mixed and yew woodland)	0.006	5	0.1	1.4	0.07	1	0.006	0.5	0.03	6.0	0.04	7
E9_1	Sweedale Croft	0.006	5	0.1	1.1	0.06	1	0.006	0.5	0.04	7.1	0.04	8

RECEPT OR ID	SITE NAME & LAND USE	24 HOUR MEAN (µg/m³)						168 HOUR MEAN (µg/m³)					
	Drain (Fen, Marsh and Swamp)												
E9_2	Sweedale Croft Drain (Fen, Marsh and Swamp)	0.006	5	0.1	1.4	0.07	1	0.006	0.5	0.03	6.3	0.04	7
E9_3	Sweedale Croft Drain (Fen, Marsh and Swamp)	0.006	5	0.1	1.1	0.06	1	0.006	0.5	0.02	4.1	0.03	5
VPI Immingham does not produce HF and is therefore not included in this table													

Table D-12: Proposed development, Vireol Plc, North Beck, Energy Pyrolysis and VPI Immingham Combined Impact on Sensitive Ecological Receptors - Nutrient Nitrogen Deposition

RECEPTOR ID	SITE NAME & LAND USE TYPE	BACKGROUND NITROGEN DEPOSITION (KGN/HA/YR)	CRITICAL LOAD (KG/HA/YR)	PC (KG/HA/YR)	PC/CL	PEC (KG/HA/YR)	PEC/CL
			LOWER		% LOWER		LOWER
E1_1	Humber Estuary (Atlantic Salt Meadows)	15.7	20	0.8	3.9	16.5	82
E1_2	Humber Estuary (Atlantic Salt Meadows)	15.7	20	0.7	3.7	16.4	82
E1_3	Humber Estuary (Atlantic Salt Meadows)	15.7	20	0.8	4.1	16.5	82
E2_1	Humber Estuary (Atlantic Salt Meadows)	12.6	20	0.2	0.8	12.8	64
E2_2	Humber Estuary (Atlantic Salt Meadows)	12.6	20	0.2	0.8	12.8	64
E2_3	Humber Estuary (Atlantic Salt Meadows)	12.6	20	0.1	0.7	12.7	64
E2_4	Humber Estuary (Atlantic Salt	12.6	20	0.1	0.7	12.7	64

RECEPTOR ID	SITE NAME & LAND USE TYPE	BACKGROUND NITROGEN DEPOSITION	CRITICAL LOAD (KG/HA/YR)	PC (KG/HA/YR)	PC/CL	PEC (KG/HA/YR)	PEC/CL
	Meadows)						
E3_1	Humber Estuary (Atlantic Salt Meadows)	12.6	20	0.1	0.6	12.7	64
E4_1	Humber Estuary (Acid Fixed Dunes)	12.5	8	0.1	0.7	12.5	156
E4_2	Humber Estuary (Acid Fixed Dunes)	12.5	8	0.1	0.7	12.5	156
E4_3	Humber Estuary (Acid Fixed Dunes)	12.5	8	0.1	0.7	12.5	156
E4_4	Humber Estuary (Acid Fixed Dunes)	12.5	8	0.1	0.7	12.5	156
E4_5	Humber Estuary (Acid Fixed Dunes)	12.5	8	0.1	0.7	12.5	156
E4_6	Humber Estuary (Acid Fixed Dunes)	12.5	8	0.1	0.7	12.5	156
E5_1	Humber Estuary (Atlantic Salt Meadows)	12.5	20	0.1	0.3	12.5	63
E5_2	Humber Estuary (Atlantic Salt Meadows)	12.5	20	0.1	0.3	12.5	63

RECEPTOR ID	SITE NAME & LAND USE TYPE	BACKGROUND NITROGEN DEPOSITION	CRITICAL LOAD (KG/HA/YR)	PC (KG/HA/YR)	PC/CL	PEC (KG/HA/YR)	PEC/CL
E5_3	Humber Estuary (Atlantic Salt Meadows)	12.5	20	0.1	0.3	12.5	63
E5_4	Humber Estuary (Atlantic Salt Meadows)	12.5	20	0.1	0.3	12.5	63
E5_5	Humber Estuary (Atlantic Salt Meadows)	12.5	20	0.1	0.3	12.5	63
E5_6	Humber Estuary (Atlantic Salt Meadows)	12.5	20	0.1	0.3	12.5	63
E5_7	Humber Estuary (Atlantic Salt Meadows)	12.5	20	0.0	0.2	12.5	63
E5_8	Humber Estuary (Atlantic Salt Meadows)	12.5	20	0.0	0.2	12.5	63
E5_9	Humber Estuary (Atlantic Salt Meadows)	12.5	20	0.0	0.2	12.5	63
E5_10	Humber Estuary (Atlantic Salt	12.5	20	0.0	0.2	12.5	63

RECEPTOR ID	SITE NAME & LAND USE TYPE	BACKGROUND NITROGEN DEPOSITION	CRITICAL LOAD (KG/HA/YR)	PC (KG/HA/YR)	PC/CL	PEC (KG/HA/YR)	PEC/CL
	Meadows)						
E6_1	Laporte Road (neutral grassland)	15.7	20	1.0	4.8	16.6	83
E6_2	Laporte Road (neutral grassland)	15.7	20	0.9	4.7	16.6	83
E7_1	Stallingborough Fish Bonds (Broadleaved, mixed and yew woodland)	24.5	10	0.5	4.5	25.0	250
E7_2	Stallingborough Fish Bonds (Broadleaved, mixed and yew woodland)	24.5	10	0.4	4.5	24.9	249
E8_1	Healing Cress Beds (broadleaved, mixed and yew woodland)	24.5	10	0.5	4.9	25.0	250
E8_2	Healing Cress Beds (broadleaved, mixed and yew woodland)	24.5	10	0.5	4.7	25.0	250
E9_1	Sweedale Croft Drain (Fen, Marsh and Swamp)	15.7	10	0.2	2.0	15.9	159

RECEPTOR ID	SITE NAME & LAND USE TYPE	BACKGROUND NITROGEN DEPOSITION	CRITICAL LOAD (KG/HA/YR)	PC (KG/HA/YR)	PC/CL	PEC (KG/HA/YR)	PEC/CL
E9_2	Sweedale Croft Drain (Fen, Marsh and Swamp)	15.7	10	0.2	2.0	15.9	159
E9_3	Sweedale Croft Drain (Fen, Marsh and Swamp)	15.7	10	0.2	1.9	15.9	159

Table D-13: Proposed development, Vireol Plc, North Beck, Energy Pyrolysis, VPI Immingham and SHBPS Combined Impact on Sensitive Ecological Receptors - Total Acid Deposition N + S (keq/ha/yr)

RECEPTOR ID	SITE NAME & LAND USE TYPE	ACID DEPOSITION (KEQ/HA/YR)[15]				TOTAL ACID DEPOSITION (KEQ/HA/YR)[16]			
		CRITICAL LOAD[17]	BASELINE	TOTAL	% OF CRITICAL LOAD	PC	% OF CRITICAL LOAD	PEC	PEC% OF CRITICAL LOAD
E1_1	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E1_2	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E1_3	Humber Estuary	Not sensitive to Acid Deposition							

[15] Acid Deposition Critical Loads
[16] Process Contribution and Process Environmental Contribution as percentages of the relevant Critical Load have been calculated using the Min CL Max N value
[17] Critical Load (as obtained from APIS, July 2018)

RECEPTOR ID	SITE NAME & LAND USE TYPE	ACID DEPOSITION (KEQ/HA/YR)[15]				TOTAL ACID DEPOSITION (KEQ/HA/YR)[16]			
		CRITICAL LOAD[17]	BASELINE	TOTAL	% OF CRITICAL LOAD	PC	% OF CRITICAL LOAD	PEC	PEC% OF CRITICAL LOAD
	(Atlantic Salt Meadows)								
E2_1	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E2_2	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E2_3	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E2_4	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E3_1	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E4_1	Humber Estuary (Acid Fixed Dunes)	Min CL Min N 0.223 Min CL Max N 0.643 Min CL Max S 0.42	N: 0.89 S: 0.26	1.15	178.8	0.01	1.5	1.16	180.4
E4_2	Humber Estuary (Acid Fixed Dunes)			1.15	178.8	0.01	1.5	1.16	180.4
E4_3	Humber Estuary (Acid Fixed Dunes)			1.15	178.8	0.01	1.5	1.16	180.3
E4_4	Humber Estuary (Acid Fixed Dunes)			1.15	178.8	0.009	1.5	1.16	180.3
E4_5	Humber Estuary (Acid Fixed Dunes)			1.15	178.8	0.009	1.4	1.16	180.3
E4_6	Humber Estuary (Acid Fixed Dunes)			1.15	178.8	0.009	1.4	1.16	180.3
E5_1	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E5_2	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E5_3	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							

RECEPTOR ID	SITE NAME & LAND USE TYPE	ACID DEPOSITION (KEQ/HA/YR)[15]				TOTAL ACID DEPOSITION (KEQ/HA/YR)[16]			
		CRITICAL LOAD[17]	BASELINE	TOTAL	% OF CRITICAL LOAD	PC	% OF CRITICAL LOAD	PEC	PEC% OF CRITICAL LOAD
E5_4	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E5_5	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E5_6	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E5_7	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E5_8	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E5_9	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E5_10	Humber Estuary (Atlantic Salt Meadows)	Not sensitive to Acid Deposition							
E6_1	Laporte Road (neutral grassland)	Min CL Min N 1.071 Min CL Max N 5.071 Min CL Max S 4.0	N: 1.12 S: 0.39	1.51	29.8	0.119	2.3	1.63	32.1
E6_2	Laporte Road (neutral grassland)			1.51	29.8	0.115	2.3	1.63	32.1
E7_1	Stallingborough Fish Bonds (Broadleaved, mixed and yew woodland)	Min CL Min N 0.357 Min CL Max N 11.119 Min CL	N: 1.75 S: 0.45	2.20	19.8	0.053	0.5	2.25	20.3
E7_2	Stallingborough Fish Bonds (Broadleaved, mixed and yew			2.20	19.8	0.053	0.5	2.25	20.3

RECEPTOR ID	SITE NAME & LAND USE TYPE	ACID DEPOSITION (KEQ/HA/YR)[15]				TOTAL ACID DEPOSITION (KEQ/HA/YR)[16]			
		CRITICAL LOAD[17]	BASELINE	TOTAL	% OF CRITICAL LOAD	PC	% OF CRITICAL LOAD	PEC	PEC% OF CRITICAL LOAD
	woodland)	Max S 10.762							
E8_1	Healing Cress Beds (broadleaved, mixed and yew woodland)	Min CL Min N 0.357	N: 1.75 S: 0.45	2.20	19.8	0.061	0.5	2.26	20.3
E8_2	Healing Cress Beds (broadleaved, mixed and yew woodland)	Min CL Max N 11.118 Min CL Max S 10.761		2.20	19.8	0.061	0.5	2.26	20.3
E9_1	Sweedale Croft Drain (Fen, Marsh and Swamp)	Not sensitive to Acid Deposition							
E9_2	Sweedale Croft Drain (Fen, Marsh and Swamp)	Not sensitive to Acid Deposition							
E9_3	Sweedale Croft Drain (Fen, Marsh and Swamp)	Not sensitive to Acid Deposition							

South Humber Bank Power Station

The SHBPS has been included in this section to consider the potential for the maximum 99.79th percentile of 1-hour NO_2 concentration from the SHBPS coincide in the same geographical location as the Proposed Development. Table D-14 shows the maximum 99.79th percentile NO_2 concentration for SHBPS, the Proposed Development, Vireol Plc, North Beck and Energy Pyrolysis.

Table D-14: Maximum 99.79th percentile of 1 hour means for nitrogen dioxide for the Proposed Development, SHBPS, Vireol Plc, North Beck and Energy Pyrolysis

GRID REFERENCE X	GRID REFERENCE Y	PC	PC% ENV STD	PEC	PEC % ENV STD
523120	413090	222.8	111.4	246.4	123

It can be seen from Table D-14 that the predicted maximum ground level concentration is in excess of the standard of 200 µg/m^3. The isoline plot in Figure 7A-6 shows that this exceedance occurs in a small uninhabited area to the south-east corner of SHBPS. Analysis of the same plot for emissions from the Proposed Development show that the maximum contribution from the Proposed Development is 2 µg/m^3 compared to 222.8 µg/m^3 from the SHBPS. The PC from the Proposed Development is therefore very small compared to the contribution from the SHBPS and it is unlikely to contribute to any exceedance of the Environmental Standard at this location. The conversion rate assumed for NO_X to NO_2 was 35% and in the case of a very large emission source like the power station such a conversion rate is very unlikely to occur over such a short distance. It is therefore considered that the addition of the Proposed Development is not likely to significantly increase the risk of an exceedance of the short term NO_2 Environmental Standard in the area around the existing SHBPS.

Table D-14 displays the 99.79th percentile of 1 hour mean concentration for each sensitive human receptor. The maximum PC is at a location on a public right of way PROW 3. The PEC for all sensitive human receptors remain below the Environmental Standard of 200 µg/m^3.

Table D-15: 99.79th percentile of 1 hour means for nitrogen dioxide, for the Worst Case Meteorological Year for sensitive human receptor locations

RECEPTOR	TOTAL PC	PC % ENV STD	PEC	PEC % ENV STD
R1	25.5	13	49.1	25
R2	47.8	24	71.4	36
R3	56.9	28	80.5	40
R4	44.1	22	67.7	34
R5	42.2	21	65.8	33
R6	41.2	21	64.8	32
R7	51.0	26	74.6	37
R8	51.9	26	75.5	38
R9	50.3	25	73.9	37
R10	48.3	24	71.9	36
R11	48.1	24	71.7	36
R12	34.8	17	58.4	29
R13	27.1	14	50.7	25
R14	23.6	12	47.2	24

RECEPTOR	TOTAL PC	PC % ENV STD	PEC	PEC % ENV STD
R15	22.8	11	46.4	23
R16	20.9	10	44.5	22
R17	21.2	11	44.8	22
R18	19.2	10	42.8	21
R19	16.4	8	40.0	20
R20	16.0	8	39.6	20
R21	16.7	8	40.3	20
PROW 1	94.8	47	118.4	59
PROW 2	97.4	49	121.0	60
PROW 3	106.2	53	129.8	65
PROW 4	93.9	47	117.5	59
PROW 5	104.6	52	128.2	64
PROW 6	105.9	53	129.5	65
PROW 7	101.9	51	125.5	63
PROW 8	93.5	47	117.1	59
PROW 9	93.0	47	116.6	58
PROW 10	90.3	45	113.9	57